**3GPP TSG RAN WG2 #121bis-e *draft R2-2304252***

**Online, 17 – 25 April, 2023**

**Source:** Huawei, HiSilicon

**Title:** Report of [AT121bis-e][112][NR NTN] CP corrections 1 (Huawei)

**Agenda Item:** 6.6.3

**Document for:** Discussion and decision

# Introduction

This document is a report of the following offline discussion:

* [AT121bis-e][112][NR NTN] CP corrections 1 (Huawei)

Initial scope: Discuss corrections in 6.6.3 (apart those on “capability”)

Initial intended outcome: Summary of the offline discussion with list of agreeable corrections/CRs

Deadline for companies' feedback: Friday 2023-04-21 08:00 UTC

Deadline for rapporteur's summary (in R2-2304252): Friday 2023-04-21 10:00 UTC

Proposals marked "for agreement" in R2-2304252 not challenged until Monday 2023-04-24 10:00 UTC will be declared as agreed via email by the session chair (for the rest the discussion might continue online).

1. Contact Information

To make it easier to find the contact delegate for potential follow-up questions, delegates are encouraged to provide their contact information in the following table:

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| --- | --- | --- |
| **Company** | **Name** | **Email** |
| Huawei, HiSilicon | Lili Zheng | zhenglili4@huawei.com |
| vivo | Xiao, XIAO | xiao.xiao@vivo.com |
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# Discussion

## SMTC

R2-2303096 Remaining issues on SMTC Huawei, HiSilicon, Google discussion Rel-17 NR\_NTN\_solutions-Core

Proposal 1: On handling the feeder link delay difference of SMTC in SIB2/4, RAN2 to choose from the following options:

- Option 2: Feeder link delay (including common TA parameters and Kmac) difference is compensated by the UE

- Option 4: Kmac part of the feeder link delay is compensated by the NW, and the time variant part (i.e. common TA) of feeder link delay difference is compensated by the UE.

- Huawei indicates that we have now reduced the options to option 2 and 4 and we need to decide.

- Oppo thinks option 2 is what we agreed. MTK, ZTE, Samsung agree with Oppo. Also Intel supports p2

- Google prefers option 4 but can accept to go for option 2

- QC thinks we need to consider the behaviour specified in the current specs and then don’t think they can agree with option 2. LGE agrees

- Apple think option 4 is easier from UE side. On the other hand, Kmac needs to be very accurate if we go for option 2. If this is confirmed, Apple can accept to go for option 2

- Ericsson think that option 2 is the only thing we can do as the NW may need to set Kmac for other reasons the SMTC alignment.

- HW thinks option 2 takes only one additional step in the UE calculation on top of option 4 so there should be no real problem for the UE.

* Continue in offline 112

The SMTC issue was discussed in Tuesday online. It can be observed that each option has its advantages:

* Option 2: Minimum spec change and more in line with the past discussions (including the discussion in RAN2 #118-e on which assistance information is needed for SMTC adjustment, and the discussion in RAN2 #119-e on SMTC and the resultant agreement that the broadcast SMTC assumes PDD = 0). Kmac of neighbour cell is broadcast and only for SMTC adjustment purposes. Most companies would like to stick to the long-standing agreements and correct spec implementations with minimum change.
* Option 4: Simpler UE implementation and does not require NW to configure an accurate Kmac; Some supporting company thinks the current field description does not mention FL PDD so everything is open and there is no backward compatibility issue.

Both Options are feasible. To progress on this topic, it is much appreciated if companies can compromise a bit.

**Q1: Please indicate below which option is preferred and whether you can accept the alternative option:**

**- Option 2: Feeder link delay (including common TA parameters and Kmac) difference is compensated by the UE**

**- Option 4: Kmac part of the feeder link delay is compensated by the NW, and the time variant part (i.e. common TA) of feeder link delay difference is compensated by the UE.**

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| **Company** | **Preferred option (2/4)** | **The other option acceptable? (Yes/No)** | **Comments** |
| Huawei, HiSilicon | Option 2 | Yes |  |
| vivo | Option 2 | Yes | For option 4, if the network wants to update the Kmac of the serving cell or neighboring cells, in addition to that SIB19 is needed to be updated, SIB3/SIB4 also needs to be updated since the Kmac part of the feeder link delay is compensated by the NW for SMTC providing. Compared to option 2, UE acquires SIB3/SIB4 more frequently. For option 2, we think the complexity of computing the feeder link delay is not much higher compared to option 4 and is acceptable. |
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Proposal 2 of R2-2303096 is the clarification for the SMTC in inter-node message, where Understanding a corresponds to the Option 2 in the Uu interface and Understanding b corresponds to the Option 4 in the Uu interface. Proposal 3 is a simple clarification that PDD is one-way.

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| Proposal 2: On SMTC configuration in MeasurementTimingConfiguration, RAN2 to choose from the following options:- Understanding a: The SMTC configuration is based on the assumption that transmitting node’s feeder link delay = 0 ms- Understanding b: The SMTC configuration is based on the assumption that the common TA of transmitting node = 0 ms (but Kmac part is already considered by the transmitting node)Proposal 3: For PDD reporting, the configured threshold by the NW and the reported PDD value by the UE refer to the one-way propagation delay. |

**Q2: Do you agree that “If Option 2 in Q1 is adopted, understanding a should be adopted; If Option 4 in Q1 is adopted, understanding b should be adopted”?**

**- Understanding a: The SMTC configuration is based on the assumption that transmitting node’s feeder link delay = 0 ms**

**- Understanding b: The SMTC configuration is based on the assumption that the common TA of transmitting node = 0 ms (but Kmac part is already considered by the transmitting node)**

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| **Company** | **Yes/No** | **Comments** |
| Huawei, HiSilicon | Yes |  |
| vivo | Yes  |  |
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**Q3: Do you agree with the following:**

**For PDD reporting, the configured threshold by the NW and the reported PDD value by the UE refer to the one-way propagation delay.**

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| **Company** | **Yes/No** | **Comments** |
| Huawei, HiSilicon | Yes |  |
| vivo | Yes | It’s better to clarify that PDD refers to one-way propagation delay since the terminology never appears in the specification before. |
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Another issue spotted by Samsung it that, Kmac is an offset corresponding to the RTT between the reference point and the gNB, not the gateway, as specified in 38.300, because the gNB may or may not co-locate with the gateway. While, the feeder link is between the NTN payload and the gateway. For SMTC adjustment, it should be clarified that the broadcast SMTC assumes “UE-gNB” PDD = 0 ms (rather than “service link” PDD + “feeder link” PDD = 0 ms). The corresponding CR is in R2-2303765, and note that the CR is based on the Option 2 in Q1.

R2-2303765 Correction on SMTC for NR NTN Samsung

**Q4: Do you agree with the changes in R2-2303765 if Option 2 is adopted in Q1?**

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| **Company** | **Yes/No** | **Comments** |
| Huawei, HiSilicon | No | We believe the R17 design is focused on the scenario where gNB is collocated with the GW, and the delay between GW and gNB can be ignored. |
| vivo | See comments | RAN2 agreed that “the case where gNB is co-located at the GW with higher priority” in the previous discussion, we think gNB is co-located at the GW is only considered in Rel-17. So whether clarify that“UE-gNB PDD = 0 ms” or “service link PDD + feeder link PDD = 0 ms” is acceptable. Furthermore, we think it’s better to capture that “gNB is co-located at the GW is only considered in Rel-17” in TS 38.300 to avoid inconsistent understanding. |
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[R2-2303412](file:///C%3A%5CData%5C3GPP%5CExtracts%5CR2-2303412_Clarification%20on%20the%20relationship%20between%20SMTC%20and%20satellite_v0.doc) Clarification on the relationship between SMTC and satellite Apple

The proponent thinks if the NW configures one SMTC for measurements on neighbour cells from multiple satellites, it would be problematic for the UEs in RRC\_IDLE/INACTIVE to adjust the SMTC due to different propagation delays of different satellites, and proposes to clarify that one SMTC configuration is only associated with one satellite in 38.300.

**Q5: Do you agree to clarify in 38.300 that one SMTC configuration is only associated with one satellite?**

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| **Company** | **Yes/No** | **Comments** |
| Huawei, HiSilicon | No | Even though restricting to one satellite is simpler, we think this is too restrictive and prefer to leave it to NW implementation.After receiving the configuration, UE implementation can do some compromise when taking multiple satellites into account. For instance, if UE thinks a satellite is more important, the SMTC can be adjusted in favor of that satellite. |
| vivo | No | If one SMTC is associated with multiple satellites, UE just adjusts SMTC based on different propagation delays of different satellites, and no problem is identified. |
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## PDD

R2-2303035 Clarification on rounding the propagation delay difference value Qualcomm Incorporated

Currently UE can only report integer value (in number of ms) of the propagation delay difference (PDD), but the actual value of PDD can be a fractional value. This CR proposes to clarify when reporting integer value of PDD, whether the actual value is rounded to (1) the nearest integer or (2) the next integer with value larger or equal or (3) the next integer with value smaller or equal.

PropagationDelayDifference-r17 ::= SEQUENCE (SIZE (1..4)) OF INTEGER (-270..270)

**Proposed change:**

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| ***propagationDelayDifference***Indicates the service link propagation delay difference between serving cell and each neighbour cell included in *neighCellInfoList,* defined as neighbour cell's service link propagation delay minus serving cell's service link propagation delay, in number of ms. First entry in *propagationDelayDifference* corresponds to first entry in *neighCellInfoList*, second entry in *propagationDelayDifference* corresponds to second entry in *neighCellInfoList*, and so on. The actual value of the service link propagation delay difference is rounded to the nearest integer value. |

**Q6: Do you agree with the above change?**

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| **Company** | **Yes/No** | **Comments** |
| Huawei, HiSilicon | No | Motivation is ok, but we think there won’t be real issues even with no clarification. The NW will use whatever the UE reports and does not care how it is rounded up, and the error is within 1ms. The granularity was designed as 1ms, meaning that error within 1ms is acceptable. Also, we wonder whether the change is backward compatible, it should be left to UE implementation. |
| vivo | No | It can be up to UE implementation. |
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## Neighbour cell measurement

R2-2303164 Correction to indicate the NTN cells belonging to the same satellite Nokia, Nokia Shanghai Bell

This CR proposes to reuse the existing *deriveSSB-IndexFromCell* field in *MeasObjectNR* to indicate whether all cells on this MO belong to the same satellite and shares the *NTN-Config*.

**Proposed change:**

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| ***deriveSSB-IndexFromCell***If this field is set to *true*, UE assumes SFN and frame boundary alignment across cells on the same frequency carrier as specified in TS 38.133 [14]. Hence, if the UE is configured with a serving cell for which (*absoluteFrequencySSB*, *subcarrierSpacing*) in *ServingCellConfigCommon* is equal to (*ssbFrequency*, *ssbSubcarrierSpacing*) in this *MeasObjectNR*, this field indicates whether the UE can utilize the timing of this serving cell to derive the index of SS block transmitted by neighbour cell. Otherwise, this field indicates whether the UE may use the timing of any detected cell on that target frequency to derive the SSB index of all neighbour cells on that frequency. For *MeasObjectNR* configuring the measurements on NTN cells, if this field is set to true, the UE assumes the same satellite and the same *NTN-Config* can apply for all cells within this *MeasObjectNR*. |

**Q7: Do you agree with the above changes?**

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| **Company** | **Yes/No** | **Comments** |
| Huawei, HiSilicon | No | This field is used to indicate some rough synchronization among intra-frequency neighbor cells. We don’t think it directly indicates the cells are from the same satellite. We think RAN2 does not need to further specify the association between satellites and neighbor cells, because it can already be determined by the UE via the list of cell IDs under the ephemeris.Also, we don’t think the change is backward compatible. |
| vivo | No | For measurement in connected mode, it is not needed to indicate whether the same satellite can apply for all cells within this *MeasObjectNR* since UE only needs to follow the network configuration for measurement gap and SMTC to perform measurement. |
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## Skip measurements

R2-2303296 Conditions to Skip Neighbor Cell Measurement in NTN Google Inc.

The stage 2 specification (TS 38.300) allows a UE implementation to skip the measurements of an inter-frequency neighbour cell, if that cell is not included in the neighbour cell configuration in SIB19. However, such implementation flexibility have not been implemented in the stage 3 specification (TS 38.304)

**Proposed change:**

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| <unchanged parts omited>- The UE shall apply the following rules for NR inter-frequencies and inter-RAT frequencies which are indicated in system information and for which the UE has priority provided as defined in 5.2.4.1: For a NR inter-frequency or inter-RAT frequency with a reselection priority higher than the reselection priority of the current NR frequency;- If SIB19 is present but the NR inter-frequency or inter-RAT frequency is not present in any of the neighbour cell configurations (i.e., *NTN-NeighCellConfig-r17*) included in SIB19, the UE may choose not to perform measurements of the NR inter-frequency or inter-RAT frequency;- Else, the UE shall perform measurements of the NR inter-frequency or inter-RAT frequency according to TS 38.133 [8]- For a NR inter-frequency with an equal or lower reselection priority than the reselection priority of the current NR frequency and for inter-RAT frequency with lower reselection priority than the reselection priority of the current NR frequency:- If the serving cell fulfils Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ:- If *distanceThresh* and *referenceLocation* are broadcasted in SIB19, and if UE supports location-based measurement initiation and has obtained its UE location information:- If the distance between UE and the serving cell reference location *referenceLocation* is shorter than *distanceThresh*, the UE may choose not to perform measurements of NR inter-frequency cells of equal or lower priority, or inter-RAT frequency cells of lower priority;- Else, the UE shall perform measurements of NR inter-frequency cells of equal or lower priority, or inter-RAT frequency cells of lower priority according to TS 38.133 [8], if these NR inter-frequency cells or inter-RAT frequency cells are included in SIB19;- Else, the UE may choose not to perform measurements of NR inter-frequency cells of equal or lower priority, or inter-RAT frequency cells of lower priority;- Else,the UE shall perform measurements of NR inter-frequency cells of equal or lower priority, or inter-RAT frequency cells of lower priority according to TS 38.133 [8], if SIB19 is not presented, or if these NR inter-frequency cells or inter-RAT frequency cells are included in SIB19.- If the UE supports relaxed measurement and *relaxedMeasurement* is present in *SIB2*, the UE may further relax the needed measurements, as specified in clause 5.2.4.9.<unchanged parts omited> |

**Q8: Do you agree with the above changes?**

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| **Company** | **Yes/No** | **Comments** |
| Huawei, HiSilicon | No | We think capturing it in stage2 is enough. The current stage3 spec does not emphasize measuring all neighbor cells on a certain frequency. |
| vivo | No | The stage 2 specification describes the case where the cell is not in SIB19, but not the frequency. Regarding the frequency, RAN agreed that the NW will configure the frequencies in SIB19 if it wants the UE to measure them. So the above changes are not needed.

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| Agreements online:1. RAN2 understands that the NW needs to configure the NTN neighbour cell frequencies in SIB19 if it wants the UE to measure them |

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## SFTD

R2-2303819 Discussion on SFTD Application for NTN cell CATT

**Observation 1: Considering the propagation delay couldn’t be ignored for NTN cell, the current definition of SFTD for TN cell is not applicable to NTN cells.**

**Proposal 1: For the issue of SFTD in NTN cell, further discuss the following solutions.**

**- Solution 1: Clarify that SFTD is not applicable in NTN.**

**- Solution 2: UE compensate the propagation delay difference to calculate the actual SFTD.**

**Q9: Do you agree with Solution 1 or 2 or none?**

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| **Company** | **Solution** | **Comments** |
| Huawei, HiSilicon | None | We think in NTN scenarios, the SFTD is a per-UE value (which as the proponent says, includes the SSB transmission timing difference and the PDD), and can be used directly for the NW to configure SMTC for the UE. That is also why we commented in the previous meetings that PDD reporting should be a mandatory feature (because it can be replaced by the existing SFTD reporting). There is no need for the UE to “compensate the PDD” (also it is not clear what “compensate” means, by removing the PDD part from the SFTD value?), because the reported SFTD is UE-specific in NTN, and does not intend to be used directly by other UEs. If the NW wants to use the SFTD values for other UEs, the NW can deduce it by implementation (NW can request the UE to report PDD as well). |
| vivo | None | It is not clear what the role of actual SFTD is in NTN scenario, before the discussion on the solution, RAN2 should first discuss whether the actual SFTD is still needed in NTN scenario. In our understanding, the SFTD is used by NW to configure SMTC, the NW should consider the propagation delay difference to configure SMTC in NTN, so the SFTD reported by UE can be directly used by the NW. Besides, if the NW wants to know the actual SFTD, the NW can calculate it since it can obtain the service link PDD between the serving cell and neighbor cell through *UEAssistanceInformation* message.But if people really identified use case that has to rely on the actual SFTD (excluding the propagation delay) and show the current tools anyway not workable, we would be open to discuss further.  |
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## RLC-Config

R2-2303460 Corrections for RLC-Config in TS 38.331 vivo

The proponent thinks the following agreement from previous meeting is not reflected in the spec (there is no chance for NW to only configure one of *dl-AM-RLC-v1700* and *dl-UM-RLC-v1700* because both IEs are mandatory), and suggests an alternative that UE ignores one of the configuration.

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| R2-2300202 Correction for RLC-Config-v1700 RadiSys CR Rel-17 38.331 17.3.0 3784 - F NR\_NTN\_solutions-Core* QC thinks at lower level both IEs are optional so we don’t need to change anything. Mediatek agrees.
* Ericsson thinks it’s good to clarify that the NW does not configure both
* RAN2 understands that the NW will only configure one IE, not both.
* Not pursued
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**Proposed change:**

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| ***rlc-Config***Determines the RLC mode (UM, AM) and provides corresponding parameters. RLC mode reconfiguration can only be performed by DRB/multicast MRB release/addition or full configuration. The network may configure *rlc-Config-v1610* only when *rlc-Config* (without suffix) is set to *am*. When *rlc-Config* (without suffix) is set to *am* and *rlc-Config-v1700* is configured, UE shall ignore *dl-UM-RLC-v1700* in *rlc-Config-v1700*; When *rlc-Config* (without suffix) is set to *um* and *rlc-Config-v1700* is configured, UE shall ignore *dl-AM-RLC-v1700* in *rlc-Config-v1700*. |

**Q10: Do you agree with the above changes?**

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| **Company** | **Yes/No** | **Comments** |
| Huawei, HiSilicon | No | Considering the agreement of last meeting, network only needs to include one empty entity in *DL-um-rlc-v1700* or *DL-AM-Rlc-v1700*. |
| vivo | Yes | Proponent. |
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## Event D1

R2-2303461 Correction on Event D1 for Rel-17 NTN vivo

In Event D1, Ml1 and Ml2 should be the distance between UE and reference location but the current description specifies them as “UE location”, so this CR tries to correct the definition.

**Proposed change:**

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| ***Ml1*** is the distance between UE and a reference location for this event (i.e. *referenceLocation1* as defined within *reportConfigNR* for this event), not taking into account any offsets.***Ml2*** is the distance between UE and a reference location for this event (i.e. *referenceLocation2* as defined within *reportConfigNR* for this event), not taking into account any offsets. |

**Q11: Do you agree with the above changes?**

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| **Company** | **Yes/No** | **Comments** |
| Huawei, HiSilicon | Yes | We think the revisions make the text more readable. |
| vivo | Yes | Proponent. |
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## T430 for target cell

R2-2303923 Clarification on T430 handling for target cell ASUSTeK, Samsung, Huawei, HiSilicon

The proponents think T430 is only restarted if the target cell is an NTN cell (i.e. not restarted if the target cell is a TN cell), and the behaviour of restarting T430 should be after DL synchronization and MIB acquisition towards the target cell.

**Proposed change:**

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| 5.3.5.5.2 Reconfiguration with syncThe UE shall perform the following actions to execute a reconfiguration with sync.1> if the AS security is not activated, perform the actions upon going to RRC\_IDLE as specified in 5.3.11 with the release cause '*other*' upon which the procedure ends;1> stop timer T430 if running;1> if no DAPS bearer is configured:2> stop timer T310 for the corresponding SpCell, if running;<unchanged parts omited>1> else (*sl-PathSwitchConfig* is not included):2> if this procedure is executed for the MCG or if this procedure is executed for an SCG not indicated as deactivated in the E-UTRA or NR RRC message in which the *RRCReconfiguration* message is embedded:3> start timer T304 for the corresponding SpCell with the timer value set to *t304*, as included in the *reconfigurationWithSync*;2> if the *frequencyInfoDL* is included:3> consider the target SpCell to be one on the SSB frequency indicated by the *frequencyInfoDL* with a physical cell identity indicated by the *physCellId*;2> else:3> consider the target SpCell to be one on the SSB frequency of the source SpCell with a physical cell identity indicated by the *physCellId*;2> start synchronising to the DL of the target SpCell;2> apply the specified BCCH configuration defined in 9.1.1.1 for the target SpCell;2> acquire the *MIB* of the target SpCell, which is scheduled as specified in TS 38.213 [13];2> if *NTN-Config* is configured for the target cell:3> start timer T430 with the timer value set to *ntn-UlSyncValidityDuration* from the subframe indicated by *epochTime*, according to the target cell *NTN-Config*;<unchanged parts omited> |

**Q12: Do you agree with the above changes?**

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| **Company** | **Yes/No** | **Comments** |
| Huawei, HiSilicon | Yes |  |
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## MIB

R2-2303924 Correction on MIB configuration for NR NTN ASUSTeK

NTN UEs skip the cell barring check when receiving MIB, but some other behaviours (e.g. apply received fields in MIB) are also skipped according to the current wording.

**Proposed change:**

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| 5.2.2.4.1 Actions upon reception of the *MIB*Upon receiving the *MIB* the UE shall:1> store the acquired *MIB*;1> if the UE is in RRC\_IDLE or in RRC\_INACTIVE, or if the UE is in RRC\_CONNECTED while *T311* is running; and1> if the access is not for NTN or the UE is not capable of NTN:2> if the *cellBarred* in the acquired *MIB* is set to *barred*:3> if the UE is a RedCap UE and *ssb-SubcarrierOffset* indicates *SIB1* is transmitted in the cell (TS 38.213 [13]):4> acquire the *SIB1,* which is scheduled as specified in TS 38.213 [13];3> consider the cell as barred in accordance with TS 38.304 [20];3> perform cell re-selection to other cells on the same frequency as the barred cell as specified in TS 38.304 [20];2> else:3> apply the received *systemFrameNumber*, *pdcch-ConfigSIB1*, *subCarrierSpacingCommon*, *ssb-SubcarrierOffset* and *dmrs-TypeA-Position*.1> else if the UE is in RRC\_IDLE or in RRC\_INACTIVE, or if the UE is in RRC\_CONNECTED while *T311* is running:2> apply the received *systemFrameNumber*, *pdcch-ConfigSIB1*, *subCarrierSpacingCommon*, *ssb-SubcarrierOffset* and *dmrs-TypeA-Position*.NOTE: A UE capable of NTN access should acquire SIB1 to determine whether the cell is an NTN cell. |

**Q13: Do you agree with the above changes?**

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| **Company** | **Yes/No** | **Comments** |
| Huawei, HiSilicon | Yes |  |
| vivo | Yes |  |
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## Missing references

R2-2303671 Correction on missing referencing of the NTN spec in 38.306 MediaTek

This CR adds the reference to 38.181-5 in several places, and also adds the following description in *channelBWs-DL* and *channelBWs-UL* (but not explained in the coversheet):

For each band, NTN capable UEs shall indicate supporting the maximum of those channel bandwidths that are less than or equal to 20 MHz for FR1, taking restrictions in TS 38.101-5 [34] into consideration.

**Q14: Companies are invited to comment on whether the changes in R2-2303671 are acceptable (and the proponent company is welcome to explain the addition of the above sentence).**

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| **Company** | **Yes/No** | **Comments** |
| Huawei, HiSilicon | Yes for adding references | The sentence added in *channelBWs-DL* and *channelBWs-UL* needs further justification. |
| vivo | Yes |  |
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R2-2303675 Correction on missing referencing of the NTN spec in 38.331 MediaTek

This CR adds the reference to 38.181-5 in several places.

**Q15: Do you agree with the above changes?**

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| **Company** | **Yes/No** | **Comments** |
| Huawei, HiSilicon | Yes |  |
| vivo | Yes |  |
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# Conclusion

To be completed